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by

G.M. Murphy, T.D. St.George, V. Guerrini, R.G. Collins, A.C. Broadmeadow, M.F. Uren and D.L. Doolan

I decided to examine the systemic biochemistry of sheep experiencing blowfly strike, a surface myiasis of sheep. The information was not available from published sources. A series of papers was produced.

As can be seen from the text the biochemistry was applied from our cooperative experiments on the inflammatory basis of ephemeral fever. The common ground with those developed with Dr St.George for ephemeral fever is evident.

The sheep were catheterised to avoid the stress associated with manual restraints and its consequential effect on biochemistry and haematology.

I carried out most of the biochemistry and extended the range of tests applied to "fly strike". In turn, these were applied in later ephemeral fever experiments, with Dr St. George.

G.M. Murphy

Date. 30/5/2000

I Agree

T.D. St.George

Date. 30/5/2000

Trace Elements in Man and Animals 6

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TRACE ELEMENT AND MACRO ELECTROLYTE BEHAVIOUR DURING INFLAMMATORY DISEASES IN CATTLE AND SHEEP

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Ephemeral fever is a disease of cattle caused by bovine ephemeral fever (BEF) virus, a rhabdovirus. It occurs in a wide band of tropical and sub-tropical Asia, Africa and Australia and is spread by insect vectors (St.George *et al.*, 1984). In susceptible cattle, BEF causes high morbidity and variable mortality. Effects are worst in prime, fat cattle and high producing cows. St. George *et al.* (1986) have argued that the viraemia should be considered as an inflammatory/toxic response as shown by the marked neutrophilia and elevated fibrinogen levels. We (Murphy *et al.,* 1986) have provided physiological support for this hypothesis by measuring changes in circulating levels of Fe, Zn and Cu during the viraemia. As well, we have confirmed an earlier report (St. George *et al.*, 1984) that in affected animals (a) uncompensated hypocalcaemia (plasma Ca < 2.0 mM L^{-1}) is commonplace; and (b) the cardinal signs (tachycardia, tachypnea, ruminal stasis and sternal recumbency) are consistent with the gross disturbance of calcium homeostasis. More importantly, phenylbutazone treatment of BEF affected cattle has shown that the trace element changes and hypocalcaemia are independent of fever per se (Murphy *et al.*, 1986). Overall, this physiological expression of BEF is consistent with an Interleukin-1 initiated sequence.

Blowfly strike in sheep (myiasis) costs the Australian Wool Industry in excess of A$150 million each year. Myiasis occurs when larvae of *Lucilia cuprina* (primary

Australian sheep blowfly) infest the fleece. Struck sheep rapidly become pyrexic and anorexic, heart and respiration rates increase markedly as does the level of circulating neutrophils (Broadmeadow *et al.*, 1984). Again, well conditioned animals are often worst affected, and even moderate strike (ca. 4000 larval burden) can reduce exercise tolerance. Sternal recumbency is common in severely affected sheep. Broadmeadow *et al.* (1984) concluded that the changes during fly strike were due to severe toxic challenge. Our results (Fig. 1: plasma Fe, Cu, Zn) support this conclusion. As well, we found elevated fibrinogen (> 8g L^{-1}) and again, as in BEF viraemia, disturbed calcium homeostasis (Fig. 1) consistent with the observed cardinal signs.

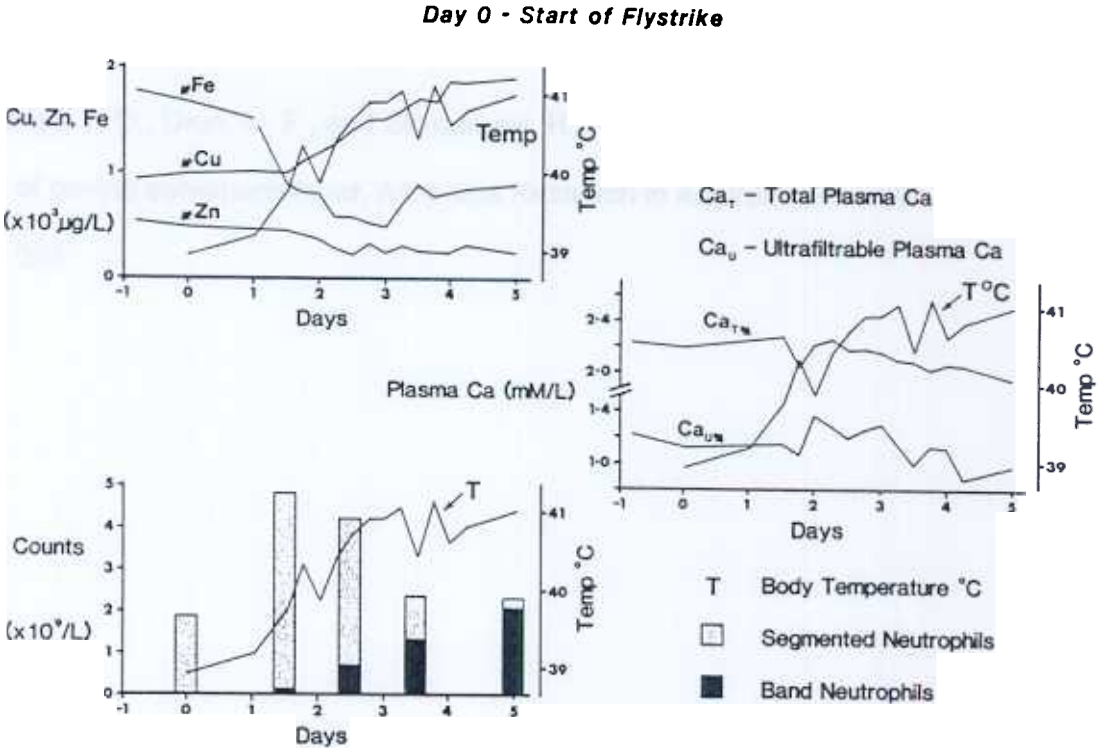

Fig. 1. Physiological response during myiasis.

We are continuing to investigate the mechanism(s) which enable(s) these two pathogens, one viral, the other parasitic, to initiate the same cascade of physiological dysfunction and similar, though not identical, clinical disease. Ephemeral fever is largely self-limiting hence its synonym, 3 day sickness, whereas myiasis continues while fly larvae remain in significant numbers.